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A LEGAL POTATO CONTROL PLAN

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On February 29, 1936, the Supreme Court of California handed down a decision* that will eventually be of great importance to potato growers in all parts of the United States.

This Court declared that the potato growers of California could regulate the quantity of potatoes to be offered for sale or sold. It was agreed also that when the method used conformed to certain legal requirements, all potato growers in the state must conform to the plan or suffer certain consequences.

There is nothing new in the thought that growers may unite to form associations and after joining do many things that may be wise or unwise, but it is new that the objecting minority can be legally controlled by the actions of the co-operating majority. In the past, no matter how well the co-operative associations have been conducted they have for the most part floundered on the shoals of the dissenting few. If a grower did not want to join a plan for regulation and wanted to assert his rugged individualism, even though it cost him many dollars to do so, there was no manner by which he could be prevented from harming himself, and, at the same time, cause great destruction to all his neighbors.

The change came about in this manner. Several years ago the California Legislature passed an act called the California Prorate Act. One of the outstanding purposes of this act was that of permitting growers to organize and develop prorate programs. If there was too much of a commodity, the Prorate Commission determined from the available facts the quantity that could be sold, so that a fair price to the producer and the consumer was maintained. The legisla-

*Agricultural Prorate Commission, etc. et al. v. Superior Court, County of Los Angeles et al. L. A. No. 15471.

ture recognized that prices far below the cost of production did not do the consumer any good and did a great deal of harm to the producer. They, therefore, planned a method by which the quantity that moved to market should equal the quantity that could be purchased, believing that under this condition, fair prices would be realized for both the consumer and the producer.

In due course of events, prorate programs were established for lettuce, sweet potatoes, potatoes in certain districts, Gravenstein apples and celery. These programs were working out so satisfactorily that finally the lemon growers decided that there was no need of their suffering the consequences of trying to sell more lemons than could be purchased. They had tried turning the excess quantity into by-products, and had done fairly well with this method with the exception that about 20 per cent of the growers would not join in the plan of diverting the surplus into by-products. The non-joining members were perfectly willing to sell all their lemons and let the co-operating group carry all the burdens of control. The main difficulty was, that every year the membership of co-operating growers became less and that of the objectors' larger. About this time the lemon growers decided to use the prorate law and after complying with the requirements the lemon prorate program was put into effect and was producing fine results. Then the same group that had profited so well by being on the outside decided to appeal to the courts in order to have the prorate law declared unconstitutional.

The following reasons were given in Court for their belief that the California Prorate Act was unconstitutional:

1. That it violated the Interstate Commerce clause of the Federal Constitution.

2. That it unlawfully attempted to delegate legislative powers in violation of certain sections of the Constitution of the State of California.

3. That it unlawfully attempted to delegate judicial power in violation of the Constitution of the State of California.

4. That it violated the 5th and 14th Amendments of the Federal Constitution which protect the private properties of individuals and the same Articles in the Constitution of the State of California.

After the overthrow of the AAA by the United States Supreme Court it looked as though the California Prorate Act could not overcome these objections which were raised against it. The highest hurdle seemed to be the 4th allegation for in the past we have always held definite views concerning what a man could do with his property. Much has been said on this subject.

Taking the objections, one by one, the California Supreme Court said in effect that:

1. Even though 99 per cent of all the lemons produced in California are shipped in interstate commerce, that before the shipments enter into interstate commerce and just as they are ready to enter the channels of interstate trade, there is a time when the state of California can regulate the movement and that in so doing they are not interfering with the exclusive right of the Federal Government to regulate interstate commerce.

2 and 3. In regard to 2 and 3, the Court ruled that the Legislature had not unlawfully delegated to the Prorate Commission either legislative or judicial powers in violation of the State Constitution.

4. The Court's handling of the fourth objection was very interesting. After reviewing a number of relevant court decisions, the Court summarized the economic relations of agriculture and society in the following words:

> "Under the authority cited herein, we are of the opinion that the Prorate Act does not violate the due process clauses of the state and federal Constitutions, nor those sections which provide against the taking of private property for public use. Neither is the act in conflict with the federal Constitution which accords to all persons the equal protection of the law."
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> "We do not feel that we are in any way or to any extent extending the principles of law enunciated in the authorities cited above by holding that such a business is so affected with a public interest or clothed with a public use as to justify the state in the exercise of its police power to impose such reasonable regulations upon the quantity of the commodity that may be produced and marketed therein as will save the industry from destruction from ruthless competition, the direct effect of overproduction. The restraint imposed by the statute operates only upon the quantity to be produced, and the amount to be marketed."

"It cannot be said that any person affected thereby is denied the equal protection of the law."

With this far-reaching and definite decision behind us, California has blazed the trail that other states interested in Agriculture may follow. The constitutions of the several states may make it necessary to proceed on slightly different lines than that used by California, but the general procedure can be the same. When the Legislatures of the various states formulate plans under which the growers may regulate themselves, they may do so with every feeling of con-

stitutional security. Methods may also be found which will conform to the Federal Constitution and the individual state which will be of great value to the growers of their particular states.

It might be well to review briefly how this principle may be used by potato growers.

The outstanding factor that causes prices to potato growers of 10c to 15c per bushel is the production, in several states, of a large quantity of potatoes, due almost entirely to very favorable growing conditions. In 1935 the surplus was in the following states, Minnesota, North Dakota, Nebraska and Colorado. In 1934 the surplus was in the New England states,—New York, Pennsylvania, and Michigan. In 1933 there was no surplus and prices were fair; and in 1932 the surplus was scattered in approximately 7 states.

With most of the potato states possessed of Agricultural Prorate Acts, and with potato programs set up, proration under these programs would be used only when the state or district grew a surplus. No surplus—no proration. When there is a surplus, the attempt to sell the surplus does not do the grower any good, and hurts all other growers. Under the prorate law, the quantity to be sold would be regulated in those districts where a surplus was grown, and the quantity that was not needed would be left on the farm.

The procedure would be comparatively simple. The heads of the potato programs for each of the states would meet at an appointed time, review the situation, decide where the surplus is and how much of the surplus exists. For example, in 1934, the burden of getting rid of the surplus would have fallen upon the farmers in Michigan, Pennsylvania, New York, and the New England states. In that year the farmers of those states could have sold about 90 per cent as many potatoes as were actually sold, but instead of selling them for 10c or 15c per bushel, they would have obtained them for the slightly smaller amount from 60c to 70c per bushel, or from four to five times the amount they did get.

In 1935, if Minnesota, North Dakota, Colorado and Nebraska had controlled their surplus, they would have received fair prices and so would the growers in all other states.

It may take some time to get your state to pass a prorate law but if growers demand one, they will secure a legal mechanism which will be very valuable to them. When not needed, the law causes no trouble but when potato prices are 10c a bushel, it will provide a method of preventing these prices.

Many times and in various ways the law will be valuable to individual states but as the states possessing prorate laws increase, the effect and value of the procedure will increase. If Maine, New York, Pennsylvania, Michigan, Minnesota, Wisconsin, North Dakota, Nebraska, Colorado, Idaho, Washington and Oregon had prorate laws like California, there would be no potato problem in the late states.

Additional information on the powers of the act may be obtained by writing Prorate Commission, Sacramento, Calif.

THE EFFECT OF IRRIGATED CROP ROTATIONS UPON POTATO SCAB[1]

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There are many references in the literature on potato scab regarding the need of long rotations to control the disease, but very little experimental data are presented in support of the statements. Likewise, data concerning the effect of the crops preceding potatoes upon the disease as compared with the effect of the time interval between potato crops are greatly lacking. Unfortunately most long-time rotation experiments were apparently planned without taking into consideration the effect of rotation of crops upon disease, so that it is often impossible to separate the effect of these two factors. This is true regarding many of the rotations in the experimental plots from which the following data were obtained, but there are a few combinations of crop sequences that have given consistent results over a period of years that may throw some additional light on this subject.

The results here reported were obtained from the irrigated rotation plots at the Scotts Bluff Sub-station on the North Platte reclamation project in western Nebraska. The plots from which the following data were obtained were started in 1912 and have been planted to the crop sequences listed in the tables continuously for the past twenty-four years. Each crop involved in each rotation is grown

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[2] The author is indebted to Dr. H. O. Werner who supplied the scab data for the years 1929-1932 and to Mr. M. Afanasiev who took all the scab readings during the past three years. Acknowledgment is made to the Scotts Bluff Sub-station for all yield data, plot histories, and cooperation in obtaining scab records.

every year, so that there are as many plots in each rotation as there are years in the cycle of the rotation. The land had not been cultivated previously to the establishment of the station in 1910. The soil is classified as a very fine sandy loam in the Tripp series and is readily permeable to water and well drained. As far as possible the same cultural treatments have been given to all plots of the same crop. Spring plowing has been used in all potato plots except those preceded by oats which were fall plowed. All plots in potatoes have been planted each year to the same variety, from the same source. The Bliss Triumph variety has been used each year since 1920.

Each of the plots is one-fourth of an acre in size and the yield data presented in table 2 are total yields from the entire plot converted to a bushels-per-acre basis. The scab records have been obtained from 100-lb. random samples collected from each plot at harvest time and the data presented are based on No. 1 size tubers (over 1⅞ inches diameter), except in 1934 when all sizes were used.

The scab records during the years 1929 to 1932 were not made on the same basis and by the same man each year but the various grades of scab, usually five different grades, have been regrouped so that they are fairly comparable for the different years and are presented in table 1. During the years 1933 to 1935, the same basis for classifying scab has been used each year and all the grading has been done by the same person. The results for these three years are presented in table 2. The greatest difference in the collection of the data for the two tables was in the "severe scab" group, which in table 1 indicates scab covering more than 25 per cent of the surface of the tuber, while in table 2 the same class represents scab lesions covering more than 2 per cent of the surface. The "severe common scab" group in table 1, however, includes some scab of the russet or superficial type or scabby flea-beetle tracks that were not included in this class in table 2. As a result of these differences in the treatment of scab data, too much emphasis should not be placed upon small variations in the percentage of scab. In spite of the deficiencies of the methods employed, a definite correlation has been found between certain types of rotations and the relative prevalence of scab as shown in the two tables and this has been very consistent during every year of the test.

Tables 1 and 2 give the results for the continuous potato plot (4)[1] as compared with those having two-, three-, or four-year rotations. Although table 1 shows a high percentage of severe common

[1] Numbers in parenthesis refer to plot numbers in tables 1 and 2.

scab in the continuous potato plot, it was mostly of a surface type or scabby flea-beetle tracks. In table 2 most of this type of scab was classified as slight. There were very large, definite scab pustules of either common or pitted type in the potatoes from this plot.

In the two-year rotations comparing corn (26), sugar beets (20), oats (24), and the latter two with manure (21, 25) applied preceding potatoes at the rate of 12 tons per acre, the most scab, particularly of the more severe types, occurred following sugar beets. The application of manure to the potato land following either beets or oats greatly increased the percentage of scab and this increase was greater following beets. A one-year interval between potatoes and any of these three crops did not reduce scab, and with beets or manure in the rotation, the percentage of scabby culls was greater than with the continuous potatoes.

TABLE 1.—*Average percentage of scab for 1929 to 1932 inclusive, in the irrigated rotation plots at the Scotts Bluff Field Station, Nebraska.*

Plot	Crop Rotation[1]	Average Percentage of Scab[2]			
		Healthy	Slight	Severe Common	Severe Pit
4	Potatoes	3.9	40.4	53.6	2.2
20	Beets, potatoes	0.6	25.3	55.7	18.4
21	Beets, potatoes (manured)	2.9	50.0	18.3	28.9
24	Oats, potatoes	4.2	48.5	39.6	7.8
25	Oats, potatoes (manured)	10.0	52.9	12.4	24.8
26	Corn, potatoes	1.2	27.7	66.4	4.8
30	Oats, beets, potatoes	6.6	54.2	4.6	34.7
31	Oats, beets (manured), potatoes	6.8	60.2	5.2	27.8
40	Beets, alfalfa (2 yrs.), potatoes	24.5	52.8	4.4	18.3
60	Oats, beets, alfalfa (3 yrs.), potatoes	33.2	59.6	1.8	5.4
61	Oats, beets (manured), alfalfa (3 yrs.), potatoes	40.0	52.2	1.9	5.9

[1] These crops have been grown in the sequence listed in the rotations on the same land since 1912.

[2] The scab records were obtained from 100-lb. random samples taken at harvest from each plot.

Slight scab = scab lesions of 1/8 inch in diameter up to 25 per cent of surface of tuber, including russet or superficial scab.

Severe scab = more than 25 per cent of the surface scabby.

TABLE 2.—*Average percentage of scab for* 1933 *to* 1935 *inclusive, in the irrigated rotation plots at the Scotts Bluff Field Station, Nebraska.*

Plot	Crop Rotation[1]	Average Percentage of Scab[2]				Total Yield in Bu. 7-yr. Aver.
		Healthy	Slight	Severe Common	Severe Pit	
4	Potatoes	26.8	69.0	0.0	4.2	64.4
20	Beets, potatoes	16.7	76.4	1.4	5.5	129.9
21	Beets, potatoes (manured)	7.3	67.0	9.3	16.4	258.1
24	Oats, potatoes	44.7	52.0	0.6	2.7	122.5
25	Oats, potatoes (manured)	13.0	71.5	8.2	7.2	238.9
26	Corn, potatoes	18.2	77.0	0.2	4.7	98.3
30	Oats, beets, potatoes	6.5	57.6	7.2	28.7	169.8
31	Oats, beets (manured), potatoes	0.1	47.0	12.8	40.2	284.7
40	Beets, alfalfa (2 yrs.), potatoes	23.7	70.7	2.5	3.1	272.7
60	Oats, beets, alfalfa (3 yrs.), potatoes	35.0	63.0	1.0	1.0	279.5
61	Oats, beets (manured), alfalfa (3 yrs.), potatoes	48.8	49.7	1.2	0.2	301.4

[1] These crops have been grown in the sequence listed in the rotations on the same land since 1912.

[2] The scab records were obtained from 100-lb. random samples taken at harvest from each plot.

Slight scab = not more than 2 per cent of the tuber surface with definite scab lesions or not more than 10 per cent of the surface with superficial or russet scab.

Severe scab = more than 2 per cent of the surface with common or pit scab.

The three-year rotations with both oats and beets, with or without manure (30, 31), have produced more scab than the two-year rotations with either of these crops and have consistently given the highest percentage of scab of the severe pitted type. This has been true for each year of the seven for which records are available.

In the four-year rotation (40) with the use of two years of alfalfa preceding potatoes, we have the first indication of a reduction in the percentage of scab. This is more evident during the first four years (table 1) than during the last three years (table 2), where the amount of scab was about the same as for the continuous potatoes.

The six-year rotations (60, 61), with three years of alfalfa preceding potatoes, have always resulted in the least scab of any of the rotations. In these rotations neither the beets nor the manure, or both, when used three years before potatoes, with alfalfa used in the intervening years, had any apparent tendency to increase scab, as in the shorter rotations.

One noticeable fact in these tests that is not apparent in the tabulated data was the difference in the type of scab produced in the long rotations, where abundant organic matter was introduced in the form of manure or alfalfa, as compared with continuous potatoes or the short rotations without manure. The amount of scab listed as slight was not significantly different in most of the rotations, but the type of scab in this "slight" class was mostly superficial or undeveloped pustules in the continuous potato plot or short rotations and of the deep type in those with abundant organic matter. This was most evident when manure was used in the short rotations with a resultant increase in the severe, deep scab class. The occurrence of this deep scab was directly correlated with the increased yields of those plots having abundant organic matter. It can possibly be explained by the fact that although there may have been more of the scab organisms in the soil and more infections in, for example, the continuous potato plot, the infections did not result in large, well-developed scab pustules because the tubers usually failed to increase in size during the latter part of the season; the plants usually being dead by the middle of August. On the other hand, with plenty of organic matter, the tubers continued to increase in size throughout the season and each scab infection resulted in a large, well-developed pustule, often of the deep type. This same relationship between type of scab and tuber development was evident in 1934, when the lowest yields ever recorded for these plots occurred. The amount of common scab was greater and that of pitted scab less than in 1935, when greater yields were obtained.

The data on yields show greatly increased yields for the longer rotations with alfalfa and those in which manure was applied. In fact, even though the application of manure in the shorter rotations increased scab, the larger yields and greater percentage of No. 1 size tubers more than compensated for the scab infection and resulted in higher yields of marketable potatoes in every instance. If we consider both the healthy and slightly infected tubers to have some marketable value and reject those of the severe type, the scab data for the past three years show that the application of manure in rotation 21 as compared with 20 resulted in an increase of 95.8 marketable bushels of No. 1 size, or an increase of 127 per cent. In rotation 25 as compared with 24 the increase was 119.3 bushels or 102 per cent, and in rotation 31 as compared with 30 an increase of 50.7 bushels or 56 per cent.

It is unfortunate that there is no comparison available between

rotations of similar length with and without alfalfa. It is probable that both the time factor and the nature of the crop preceding potatoes have an effect on the occurrence of scab. It must be remembered, however, that a high percentage of scab often occurs on virgin soils, which fact would minimize the importance of the time element. Organic matter as such, however, can hardly be the answer when we look at the results obtained with manure. Neither can we accept the explanation that the turning under of green manure will change the reaction of a soil to a point where it is too acid for the development of scab. The soil in these plots averages about pH 7.5. It is more probable that the nature of the crop and cultural treatments change the balance of the microörganisms in the soil in such a way that the numbers of scab organisms are decreased and the result is fewer infections. In addition these same factors influence the development of the potato tuber and result in differences in the type of scab produced following infection.

For practical purposes we can conclude from the above data that short rotations and rotations where beets immediately precede potatoes are, in general, undesirable, and that the longer rotations with alfalfa preceding potatoes are desirable, from the standpoint of both high yields and less scab. Manurial treatments are not desirable from the standpoint of scab, but are justified in short rotations because of the large increase in the yield of No. 1 size potatoes.

REPORT OF THE RESEARCH COMMITTEE ON POTATO BREEDING

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This report is intended to cover so far as possible the work of American and foreign investigators which relates to potato breeding. It is based on papers published during the year 1935 and in one instance during the latter part of 1934.

Since reports of much of the foreign work are available only in the form of abstracts, such sources have been drawn upon in this survey, particularly those of Plant Breeding Abstracts of the Imperial Bureau of Plant Genetics, Cambridge, England.

The work that has been accomplished in the different countries includes nearly all phases of potato breeding. Special attention is

being given the breeding for resistance to frost and to the most important diseases, particularly scab, late blight, wart and the virus diseases.

Cytology

Ellison (8) in a study of the root tips of 42 varieties of potatoes found the somatic number 48 to be constant for all the varieties studied. He observed great variations in the size of the chromosomes, large sizes occurring in some varieties and not in others.

Studies of the macrogametophyte of the potato by Rees-Leonard (11) revealed developmental and cytological irregularities which, it is suggested may have a bearing on seed formation.

Genetic Studies

Extensive studies of the genetics of color in the potato have been made by Asseyeva and Nikolaeva (2). Genetic formulae are given for the different phenotypic expressions of color in the tubers, sprouts and flowers. The genes investigated were found to occur in duplicate pairs. The authors state that this can be explained by assuming that the potato is tetraploid. Further work on this point is being undertaken.

A summary of the data which have been obtained regarding the genetic composition of the Katahdin with respect to certain characters has been presented by Clark and Stevenson (4). Since this paper is available in the American Potato Journal no abstract will be given here.

The results of crosses between cultivated varieties of *Solanum tuberosum* and wild species and with forms of *S. andigenum*, reported by Emme and Veselovskaja (9), led them to conclude that, with respect to yield, the mode of inheritance was more complex than that represented by Salaman's assumption of 2 cropping factors. Dominance of the late maturity characteristic of *S. andigenum* was shown in the hybrids. Most of the interspecific hybrids showed resistance to late blight and the virus diseases.

Breeding

An account of the breeding work at the experiment station of the "Ragis" firm at Muhlendorf, Germany, is given by Roth (12). The chief objective is the production of commercial varieties of the following types: (1) early yellow varieties; (2) mid-early yellow varieties; (3) varieties of the Industrie type; (4) industrial varieties rich

in starch; and (5) feeding varieties with high yields. It is stipulated that all must be wart-resistant. Efforts are also being made to include blight resistance.

Frost Resistance

During the past few years much work has been done by Russian investigators on resistance to frost. The results of tests of South American species and varieties and of seedling progenies at Hibiny, which is within the arctic circle, are reported by Vesselovskii (13). Some of the introduced forms have shown relatively high resistance. These have been used extensively in hybridization. Seedlings of the progenies from this source have withstood a temperature of 27.9°F. in bog soils and 26.2° in ordinary soils. A species hybrid, *S. acaule* x *S. goniocalyx*, continued to flower at a temperature of 21.7°.

Observations on frost resistance have been made by Aamodt (1) in connection with tests of potato varieties, in which were included new varieties from the United States, to determine their adaptability to conditions in Alberta. Following a severe freeze four varieties were found to manifest considerable resistance to frost, viz., Katahdin, Chippewa, Golden and Columbia Russet.

Scab Resistance

Darling, Leach and Krantz (7) found a wide range of resistance to scab in seedling progenies. A high degree of resistance was manifested in smooth- and thick-skin seedlings, as well as in the russet types. No correlation was found between color of tuber and scab resistance.

Late Blight

In a paper by Crosier and Reddick (5), which deals chiefly with the ecologic relations of the potato and the late blight fungus, reference is made to studies in which no indication was found that susceptibility was altered by an external condition which affects the development of the plant. These observations were based on the behavior of susceptible plants only.

The behavior of biologic strains of Phytophthora on cultivated potato varieties, on the Ef and W resistant races and on *Solanum demissum* and its hybrids with cultivated varieties, is described by Müller (10). The results indicate that at least three different groups of biotypes are concerned. He believes that it is possible to obtain potato varieties resistant to late blight by species crosses between *S. demissum* and *S. tuberosum*.

Resistance to Wart

The inheritance of resistance to wart is considered by Black (3) to be dependent upon the cumulative interaction of three factors inducing resistance which are designated as A, B and C. Each is given a numerical value, viz., A = 1, B = 2 and C = 3, which represents approximately the relative power of factorial contributions towards resistance. A sum of these values which exceeds seven is considered to indicate resistance.

The problem of resistance to wart is outlined by Collins (6) in a paper which consists of a discussion of the work of other investigators, together with previously unpublished results of the author. The conclusions suggest that the number of factors concerned is few rather than many.

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THE ADDITION OF MERCURY COMPOUNDS TO THE FERTILIZER MIXTURE AS A CONTROL FOR COMMON SCAB OF THE POTATO UNDER LONG ISLAND CONDITIONS

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Under Long Island conditions the common scab of potato has been kept fairly well under control by watching the soil reaction closely. Usually scab is not a serious factor if the soil reaction is not allowed to go higher than pH 5.2. On the other hand if the soil reaction is below pH 4.8 the yield is greatly reduced. Under these conditions it can be readily seen that there is a comparatively narrow margin of soil reaction within which potatoes may be safely and profitably grown.

In recent years many cases of severe scab injury have been reported where the soil reaction was known to be well below pH 5.0. This condition, together with reports from stations in the United States and Canada concerning the value of the addition of mercury compounds to the fertilizer mixture, resulted in a series of tests being started at the Long Island Vegetable Research Farm.

Two varieties of potatoes are commonly grown commercially on Long Island: namely, Irish Cobblers and Green Mountains. Both of these varieties were included in the tests.

The soil on which the potatoes were planted is a sassafras silt loam with a gravelly subsoil. Drainage conditions are excellent. The soil reaction in this area varies from pH 5.0 to pH 5.7. Scab infestation is this area is about as uniform as could be expected under field conditions.

Seeding was done with a planter which placed the fertilizer at both sides and slightly below the level of the seed piece. The fertilizer used was a 5-8-5 mixture, approximately neutral in reaction, and was applied at the rate of one ton per acre. Each plat was approximately 1/80 of an acre.

Both yellow oxide of mercury and calomel were used in the tests. Each of these materials was used in three different amounts; namely, two, four, and six pounds per ton. Every effort was made to have these mercury compounds thoroughly incorporated in the fertilizer mixture.

When harvested the tubers from each plat were run over a hand grader, the screen of which was slightly smaller than that required for a U. S. No. 1 grade. The weights of the culls were recorded for

use in calculating total yields. Scab records were taken only on marketable tubers. The tubers were sorted into four classes according to scab infestation. These classes were as follows: clean, free from scab; slight, 1-5 scab spots; medium, 6 to 15 scab spots; and severe, more than 15 scab spots.

This classification is an arbitrary one and allowance had to be made for the size of the tuber and the size of the scab spots.

Effect of Mercury Compounds on the Amount of Scab and Yield

The results reported in the following tables are based on four replications and represent two years' results. The figures are based on percentage by weight and were found to conform very closely with the data taken by counting the tubers.

Table 1.—*Effect of yellow oxide of mercury on scab infestation on Irish Cobblers,* 1934-'35

Pounds per ton	Percentage Scabby Tubers by Weight			
	Severe	Medium	Slight	Clean
None	7.69	10.67	25.47	56.23
2 lbs.	2.34	2.61	17.02	78.03
4 lbs.	0.65	1.26	11.12	86.97
6 lbs.	0.60	2.07	10.60	86.73

Table 2.—*Effect of calomel on scab infestation on Irish Cobblers,* 1934-'35

Pounds per ton	Percentage Scabby Tubers by Weight			
	Severe	Medium	Slight	Clean
None	11.26	12.38	37.91	38.45
2 lbs.	4.18	9.92	35.18	50.72
4 lbs.	2.02	5.96	33.09	58.93
6 lbs.	1.62	3.32	25.79	69.27

Table 3.—*Effect of yellow oxide of mercury on scab infestation on Green Mountains,* 1934-'35

Pounds per ton	Percentage Scabby Tubers by Weight			
	Severe	Medium	Slight	Clean
None	16.59	15.22	31.80	36.39
2 lbs.	1.74	7.74	28.28	62.24
4 lbs.	0.41	2.40	12.94	84.25
6 lbs.	0.74	4.26	18.38	76.62

TABLE 4.—*Effect of calomel on scab infestation on Green Mountains, 1934-'35*

Pounds per ton	Percentage Scabby Tubers by Weight			
	Severe	Medium	Slight	Clean
None	11.68	23.03	44.44	21.85
2 lbs.	5.62	12.25	38.25	43.88
4 lbs.	5.11	11.53	28.01	55.35
6 lbs.	4.36	9.96	29.14	56.54

The figures show that, under Long Island conditions, there may be a marked decrease in the scab infestation following the addition of either yellow oxide of mercury or calomel to the fertilizer mixture. The yellow oxide of mercury is somewhat more effective than calomel, especially when used in smaller amounts. There would seem to be little or no advantage in using more than four pounds to the ton of either of the compounds used in these experiments.

In the season of 1934 the plats treated with mercury compounds showed, in most cases, that the yield was decreased and where there was an increase in yield the amount was very slight. In 1935, however, the treated plats yielded decidedly higher than did the untreated plats.

TABLE 5.—*Effect of the addition of mercury compounds to the fertilizer on the yield of Irish Cobblers, 1934-'35*

	Yellow Oxide of Mercury per Ton			
Year	None	2 lbs.	4 lbs.	6 lbs.
1934	239.00	218.79	236.44	222.25
1935	219.86	258.06	287.92	264.00
	Calomel per Ton			
Year	None	2 lbs.	4 lbs.	6 lbs.
1934	244.69	251.95	242.80	210.62
1935	213.10	236.20	223.82	239.08

TABLE 6.—*Effect of the addition of mercury compounds to the fertilizer on the yield of Green Mountains,* 1934-'35

	Yellow Oxide of Mercury per Ton			
Year	None	2 lbs.	4 lbs.	6 lbs.
1934	246.76	249.56	249.15	259.71
1935	192.22	269.61	275.71	253.60
	Calomel per Ton			
Year	None	2 lbs.	4 lbs.	6 lbs.
1934	211.77	219.78	198.33	196.84
1935	190.49	231.99	245.19	242.05

SUMMARY

Under Long Island conditions the addition of either yellow oxide of mercury or calomel to the fertilizer mixture reduces the infestation of common scab of the potato. Four pounds per ton of either of these compounds seems to be the proper amount to use. Yellow oxide of mercury is somewhat more effective in controlling scab than is an equal amount of calomel.

The yield on treated plats was slightly less in the season of 1934, but decidedly greater in 1935.

SECTIONAL NOTES

CALIFORNIA

The acreage planted in the Shafter District is as large, if not larger, than last year and the growing conditions have been very favorable. A couple of minor touches of frost were experienced but nothing of a consequential nature. If nothing interferes, the Shafter District will have a considerably larger quantity of potatoes this year than last year. They are already beginning to move in boxes and early in May they will be shipping carloads and sacks. If present indications are fulfilled, the Shafter District will have between 8000 and 9000 cars of potatoes for sale.

The Shafter District is becoming a definite competitor to all the second early and intermediate crops. If the crop in the Shafter District continues to increase as it has done the last few years, there will have to be a new alignment among the early and intermediate states. More potatoes are being grown than can be consumed so somebody will have to give way. (Apr. 6).—H. G. ZUCKERMAN.

COLORADO

The government estimate on acreage, released in March, shows that no increase is expected in Colorado during the current year, 84,000 acres having been planted in 1935, and the same number expected for the 1936 planting. Recent price advances, however, may make some changes in these figures. The Peachblow, or Red McClure, still brings the highest price on the Chicago market, and stock in white cotton bags is bringing a premium over that in burlap bags.

Certified seed in this state was practically sold by April 1, and an increase in acreage for certification is expected. Numerous meetings have been held to discuss the new Soil Conservation Act. The consensus of opinion in Colorado is that it is impractical to regulate potato acreage since the variation in yield from season to season is so extremely great. Growers are also of the opinion that the cash payments for replacing potato acreage are not sufficient. Those who have given the question the most thought agree that the solution for the potato problem at the present time is a marketing agreement, national in scope, whereby the crop moving to market is to be regulated according to grade, in case surpluses develop. If such a plan is proposed it will be necessary to have considerably more information than is available at present on the feeding value of potatoes, as it is felt that the best outlet for surplus or low grade stock in Colorado is as feed for livestock. We feel, then, that it depends on the workers in the various Experiment Stations, to not only investigate the feeding value of potatoes carefully but also to give their findings considerable publicity. (Apr. 11).—C. H. METZGER.

INDIANA

We will plant approximately 75,000 acres, the same as last year. There will be a small increase in the commercial acreage and a decrease in small plantings which will just about balance. Our Indiana growers have ordered, and are using, more certified seed than ever before. Last year, for the first time, two of our potato growers of Northern Indiana had some of their own seed certified and it looks as if grow-

ers in the Northern counties will do likewise. We also expect many of the growers in Southern Indiana to certify their late crop of Cobblers. Table stock is retailing for $1.60 and is only fair in quality.

The new soil conservation program should be of great benefit to the potato growers, although this is something that a number of our growers have followed in the past, it is also something that every good potato grower should do regardless of benefit payments. (Apr. 14). W. B. WARD.

KENTUCKY

Planting has been delayed by an excessive amount of rain and by unreasonably cold weather. Probably thirty per cent of the crop is planted and has, in fact, been planted for six weeks. The intentions to plant in Kentucky are approximately normal, but there is a possibility that some of the early acreage will have to be shifted to "second crop" potatoes. This year there will be an increased use of 6-10-6 fertilizer, instead of the customary 5-10-5, because the growers who have tried the higher nitrogen fertilizer have found that the benefit from higher nitrogen fertilization is quite pronounced, in that the potatoes are nearly mature before our spring rains cease. (Apr. 10). JOHN S. GARDNER.

MAINE

Maine has shipped about 36,000 cars to date. Conservative opinion is of the belief that there will be a total shipment from Maine, this year, of approximately 42,000 to 43,000 cars. The higher the price, the greater the tendency to ship all the potatoes available.

Growers' applications for loans from the Aroostook Production Credit Association are being sent in rapidly. Opportunity is made available for them to secure some advantages in purchasing their fertilizer through Maine Potato Growers', Inc., at a saving hitherto not available to the small grower.

Growers, as well as dealers, seem disposed to move potatoes freely on any price advances which, of course, will tend to benefit the whole deal. Advances seem to be in order in view of the shortage of supplies both of the old crop, and the new crop that will mature a little later.

The weather continues to be cold and stormy. The frost is out of the ground, and the land is in a condition to be worked as soon as warm weather and sunshine return. Prospects for a moderate increase in acreage are evident. There will be considerable pressure, however, on the part of public opinion, to hold down acreage. Some

contracting is being done. The extent of this is not evident at present. Whether the total volume contracted will exceed that of last year still remains to be seen.

The A. P. C. A. are operating on the same basis as they did this year. The results of this program are increasingly seen as beneficial to the entire potato industry. While there has been much discussion about growers withdrawing from the P. C. A. whenever opportunity is available, it now appears from the number of applications coming in, that there will be about the usual demand for credit from this source. A healthy development is found in the change of policy, which, during the current year permits the grower to be considered upon his own individual merits, rather than to establish arbitrary limits for all borrowers.

Machinery dealers are actively soliciting business, although as yet very few new transactions have been made. There has been a number of re-alignments in the retail machinery business this year.

Farmers have been reluctant to order fertilizer because of the uncertainty concerning their future plans, but more largely because of a tendency on the part of every one to postpone purchasing until the last minute. This is working a hardship on the fertilizer companies, but the grower is finding some economies resulting from this method of conducting business.

An organization is being planned to administer the soil conservation program to succeed the old Agricultural Adjustment Administration plan as developed under the Warren Bill. The general sentiment favors this new plan; chiefly because it permits voluntary cooperation rather than secures results by compulsion. It is particularly fortunate that the County Agents are now acting in an advisory capacity, rather than in a more or less executive capacity which would have been the case under the Warren Bill. (Apr. 14).—FRANK W. HUSSEY.

NEW YORK

Reports on intentions to plant in New York this year indicate a two per cent decrease below last year and six per cent decrease in acreage below the five-year average. This is in accord with the general intentions for the important Eastern states.

On April 5, the crop on Long Island was estimated to be about one-half planted. Wet weather and freezing temperatures have delayed operations to the extent that planting will be a little later than normal. Similarly, because of excessive rains in up-state New York, growers of potatoes in the muck areas will be unable to prepare their soil for planting at the usual time.

There is a keen demand for seed of the newer varieties, such as Chippewa, Golden, Warba and Katahdin. Seed has been furnished fourteen different county farm bureaus for comparison with standard varieties and for study of adaptation. Last year's tests were especially favorable for Chippewa and Warba. Golden gave a poor performance throughout the tests, which were planted on both muck and upland soils. The New York Cooperative Seed Potato Association reports that stocks of Green Mountain seed are about sold out, whereas the supply of Cobblers and Rurals is still plentiful.

Several new potato research projects are contemplated by the Cornell Experiment Station pending appropriations by the Legislature. Among these are included projects on the study of potato rotations, breeding of improved varieties, construction of a special greenhouse for the study of potato virous diseases and the study of yellow dwarf. At the present time much interest is shown in the study of consumer preference for potatoes in the Cleveland market. Since March 1, the Departments of Marketing, Home Economics and Vegetable Crops have had representatives in this market. Records of buying procedure, store practices, and home consumption are being taken. Duplicate samples of potatoes bought by the consumer at each store are shipped to Ithaca for analysis as to grade, condition and defects. This will be followed up by cooking tests. To date four hundred and twenty-seven store records and two hundred and forty home records have been obtained. From sixty-three stores visited, one hundred and forty-two potato samples have been obtained for analysis. It is hoped that the results may yield better information on consumer preferences and practices. (Apr. 11).—E. V. HARDENBURG.

NEBRASKA

Although the disposal of the Nebraska crop of potatoes began under rather adverse conditions during the early fall, the situation finally improved so that, taken as a whole, the price received for the Nebraska Triumph crop has been reasonably satisfactory. The stocks of Triumph potatoes have been cleaned out more closely than at any time in recent years. It is very likely that the limited quantity of seed stock on hand will be the factor that will prevent a considerable expansion this spring. Were it not for this shortage of seed a considerable increase in acreage could be anticipated because of the fact that winter wheat in the dry land territory is practically lost and the conditions at the present time are very unfavor-

able for the planting of spring grain. The soil is still very dry, since there has been very little rain in the dry land section since June. There is, of course, considerable opportunity for enough rain from now until the middle of June to warrant the planting of a potato crop.

Recent studies made by the writer indicate that the rainfall prior to planting, or at least prior to the emergence of potatoes is probably the dominating factor in determining the yield of potatoes in most seasons. If the subsoil below the second foot is dry, the chances of getting a good crop of potatoes are rather poor because of the uncertainty of the time of occurrence and the amount of rainfall during late July and early August when the roots get down to a depth of three feet. It is for this reason that more and more interest is being shown in planting potatoes after summer fallow, or in planting them after corn which seems to leave more moisture in the soil than does small grain.

In the eastern part of the state where early potatoes are grown the soil is somewhat dry in most places and unless heavy rains occur within the next week the early crop may be seriously retarded with a consequent reduction in yield. (Apr. 13).—H. O. WERNER.

NORTH CAROLINA

Excessive rains have prevailed in our potato growing area for the past two weeks and, although it is too early to judge, with any degree of accuracy, it can be foretold that the stand will be poor and that there will be at least a twenty-five per cent loss. Many of our growers have re-planted their fields where they found the seed potatoes had rotted. We will not be able to tell the prospects of our crop until we get some clear warm weather to hasten the germination of the potatoes. (Apr. 11).—ROBERT SCHMIDT.

NORTH DAKOTA

North Dakota had an unusually large amount of snow this winter, and some snow still fell the early part of April, with temperatures prevailing much below freezing, and falling below zero a few nights in April. Our spring planting season will, therefore, probably be delayed ten days to two weeks this spring. With the much-needed moisture which the snow has brought, and the sudden warming-up which is bound to follow after the cold spell breaks, we are anticipating prompt germination of the potato crop after it is planted.

The acreage of certified potatoes, as well as common potatoes in this state, will probably be about the same as it was last year. (Apr. 11).—E. M. GILLIG.

OHIO

Cool wet weather has delayed the planting of the early crop of potatoes. Only a small percentage of the acreage has been planted to date. In seasons of normal weather, practically the entire acreage of early potatoes is planted by this time of year.

The potato acreage in Ohio will be practically the same as that of last year. The delay in the planting of the early crop will, no doubt, reduce the yields as the delayed planting will mean that the crop will mature during hot weather.

This past year eleven counties in the state graded and sold cooperatively about 400,000 bushels of potatoes. The salesman selling potatoes for this group of counties had no difficulty interesting the large buyers of potatoes. The best grade packed by these Associations is called "Gateway Brand". This brand is packed under a two-inch minimum grade. They also pack U. S. No. 1, and U. S. No. 2; and some of the potatoes are sold as Growers' Grade. Many of these potatoes were sold out the state; the better grades in Pittsburgh, others in the states south of Ohio. (Apr. 14).—E. B. TUSSING.

SOUTH CAROLINA

The potato crop in South Carolina was making splendid progress during March. However, a light frost on April 3rd slightly injured some of the plants. This cool spell accompanied by heavy rains may retard the growth of the crop to a slight extent.

The acreage is estimated at 10,500 as compared with 9,500 in 1935. Potatoes were planted slightly later than usual but were in the ground by March 1st. Movement is expected to take place about May 15th. There is a possibility that more 100-pound sacks will be used this year than last season.

It is not thought that the Soil Conservation Act will affect the potato acreage to any extent in South Carolina. (Apr. 8).—GEO. E. PRINCE.

TENNESSEE

Our Irish potatoes at the Experiment Station were planted during the first week of March and the sprouts on the seed pieces are about two inches long. In March we experienced a very cold, rainy period. Indications point to the fact that the acreage planted this year will exceed that of 1935. (Apr. 9).—BROOKS D. DRAIN.

VIRGINIA

At this season of the year the average potato grower invariably shows concern about the potato acreage planted in his own and competing areas.

Until his potato season is over, the farmer is interested in, but does not follow too closely, the forecasted intentions to plant. Perhaps he does not have sufficient faith in the forecast or possibly he expects his neighbors or competitors to adjust acreage in accordance with the recommendations and therefore permit him to have a greater opportunity with a larger acreage.

However, immediately after plantings, a keen and very definite interest is manifested by the farmer in the acreage which will market competitively with his own crop, the seasonal factors which tend to modify time of harvest, yields and overlapping of harvest season between districts. These speculations are under way on the Eastern Shore of Virginia.

The acreage on the Eastern Shore of Virginia has been somewhat reduced this year. The reduction is not so large as had been anticipated and probably will not exceed ten per cent as compared with last year's acreage except for the probability of considerable water injury in the low-lying lands. Such injury has taken place but no one can at this time determine the extent of the loss.

Contrary to Government reports the information reaching the Eastern Shore of Virginia from the North Carolina section indicates from ten to fifteen per cent acreage increase over last year. Later reports of rot caused by excess moisture followed by replanting indicate that the acreage may not be increased much over last year as some injured acreage was not replanted.

The wet weather has not only delayed planting but has caused loss to some unknown degree in the planted areas. Unless the season is unusual the late plantings will not give a normal yield and possibly some of the earlier plantings will be injured from excess moisture. Again, the heavy rains have undoubtedly leached much fertilizer. It would, therefore, appear that the production in these two states should not exceed that of last year and possibly may be smaller.

The delayed planting in Carolina may cause that crop to overlap in marketing season with the Eastern Shore to a greater extent than normal. Likewise the increased acreage in the Shafter District of California tends to create an unpleasant possibility unless the yield in the East is below normal and the market demand increases.

The growers likewise are depending on the old potato situation to be of great importance in developing a better marketing situation for this season.

The farmers on the Eastern Shore have not yet become actively interested in the Soil Conservation and Domestic Allotment Act. The first meetings were held on the Eastern Shore last week and in the discussions that took place it was believed that if this program were to be of special service in this area, where each acre normally produces at least two crops each season, it would be necessary to have a ruling passed which would provide credit for a soil improvement crop following a soil depletion crop, even though that credit might only be fifty per cent of that set up for a soil improvement crop which utilizes the land throughout the season. Such a ruling would provide that at least two acres either in early spring or in the fall would have to be planted in a soil improvement crop in order to get one credit as it exists under the Soil Conservation program at this time. This procedure would be optional and in no wise interfere with the plans already developed. Such modifications would not only permit the intensive truck areas to benefit under the Act to greater extent than now seems possible but it would also, in the opinion of many, promote a better farm management system than now exists. (Apr. 13).—G. S. RALSTON.

WISCONSIN

At this date a schedule of town meetings has been arranged in compliance with federal plans for administering the new Soil Conservation Act. In Wisconsin the major part of the potato crop is grown in the diversified farming areas. Therefore the growers are showing a general interest in the plan and will no doubt take such action as is permitted and planned under the act.

We have just completed a series of potato meetings in the northern and central areas of the state. Shortage of seed is evident in some of the late variety producing sections because of low temperatures experienced last October, and also because of losses from freezing in storage.

There is a limited supply of Katahdin and Chippewa varieties and the department has arranged to get some of this stock planted on a field scale in the New York areas where a shortage of seed is evident.

It has been estimated by many that carlot shipments this year will reach 6000. This is in contrast to a carlot movement in 1934-

1935 of 17,500 cars. This, of course, does not include the truck movement.

In view of such radical fluctuations as this, due largely to seasonal conditions, it is of course hazardous to make any prediction concerning how the present program may affect the 1936 crop.

We expect a continued conservative policy on acreage to be followed in Wisconsin in 1936. (Apr. 9).—J. G. MILWARD.

REVIEW OF RECENT LITERATURE

The relative vigor and productivity of potato plants from basal and apical sets cut from tubers in different stages of sprouting, F. C. STEWART (*New York State Agr. Exp. Sta. Bul.* 658 (1936)).

Results are presented from experiments conducted in 1934. Plants from apical sets outyielded plants from basal sets of equal weight from the same tuber, especially when the seed tubers were cut when the first apical sprouts were ¼ to ½ inch long. When seed tubers were cut before sprouting there was little or no difference in yield.

On the average, plants from apical sets emerged a little earlier, were slightly larger previous to blooming, had fewer stalks, matured a little earlier and gave a larger total yield than plants from basal sets of equal weight from the same tuber.

Reviewer's Comment. It is very doubtful if any physiological difference exists between basal and apical sets. Results of experiments by the reviewer for the past four years concerning the propagation value of seed potatoes as affected by storage conditions indicate that type and extent of sprout growth at time of planting may account for the differences obtained between basal and apical sets. For instance, tubers stored at 45° F. and therefore well-sprouted at planting time when compared with those stored at 35° and not sprouted will possess most of the qualities of an apical seed piece when compared with a basal seed piece, i. e., plants will emerge earlier, will be larger previous to blooming, will mature earlier and give larger yields. When a well sprouted, apical set is compared with a basal set with a few short sprouts, or no sprouts at all, from the same seed piece, it is similar to comparing the results of seed stored at 45° and 35°. However, if the tuber is cut into an apical and basal set before either is sprouted, then both sets will sprout more nearly alike and, consequently, little or no difference will be obtained from them after planting. In other words, the extent and type of sprout growth, regardless of position of the set on the tuber, determines the response of the set after planting.—ORA SMITH.

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MAINE GROWERS SUPPORT THE ASSOCIATION

The Potato Association of America is the only national organization devoted solely to the interests of the potato industry. No one can question the need of such an organization when we consider the importance of our national potato crop which in 1935, a season of low prices, was valued at 208,713,000 dollars.

In order to meet the competition which is increasing each year the potato grower must become acquainted with the new developments in the industry. New ideas on cultural practices, disease and insect control, marketing, etc., are constantly arising. This information appears in various publications, many of which are not readily available to the growers. The American Potato Journal presents much of the information, either in the form of original articles or as abstracts, under one cover. We hope to make the Journal truly represent the industry and we believe progress has been made in this direction since leading potato growers in many states apparently appreciate its value. A prominent seed grower in Maine, for example, recently wrote, "Having read the Journal for a number of years, I am convinced that many growers would subscribe if they once became interested in the subject matter of the Magazine."

The number of readers has increased greatly in the past three years, but we believe that many more growers should receive the Journal. Members of state potato associations in Washington, New York and New Jersey now receive the Journal. Recently W. C. Libby, Verne Beverly, M. S. Smith, Ray D. Hews and other leaders in the industry in Maine conducted a campaign which resulted in 125 new members from the state. Similar efforts, if put forth in other states, would soon result in a membership of several thousand. An increase of this nature, in membership, would make it possible to enlarge the Journal and would enable us to serve the industry more efficiently. A strong national organization composed of leading growers and research workers should certainly result in improvements in the potato industry.